

EXHIBIT P



Reflective GaAs SP4T Switch DC - 4 GHz

Features

- Low Insertion Loss: 0.7 dB Typical
- Fast Switching Speed: 4 nS Typical
- Ultra Low DC Power Consumption
- Small Package Size: 0.250" Square

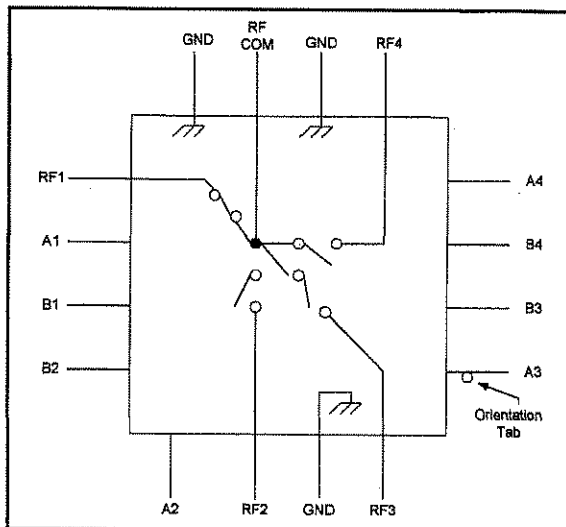
Description

M/A-COM's SW-243 GaAs MMIC SP4T switch is packaged in a CR-4 surface mount ceramic style package. The SW-243 is a reflective switch, optimized for low insertion loss. The CR-4 package is hermetically sealed, making these switches ideal for space, military radios, or other environmentally harsh applications.

Typical applications include synthesizer switching, switch matrices and filter banks in systems such as military radios, and space equipment.

The SW-243 is fabricated as a monolithic GaAs MMIC using a 1.0 micron MESFET process.

Functional Schematic



Pin Configuration³

Pin No.	Function	Pin No.	Function
1	RF Port 1	9	Control A3
2	Control A1	10	Control B3
3	Control B1	11	Control B4
4	Control B2	12	Control A4
5	Control A2	13	RF Port 4
6	RF Port 2	14	Ground
7	Ground	15	RF Common
8	RF Port 3	16	Ground

3. Bottom of case is RF ground.

Ordering Information

Part Number	Package
SW-243	Ceramic (CR-4)

Absolute Maximum Ratings^{1,2}

Parameter	Absolute Maximum
Input Power 0.05 GHz 0.5 - 4.0 GHz	+26 dBm +33 dBm
Control Voltage	-8.5 V ≤ V _c ≤ +5 V
Operating Temperature	-55°C to +125°C
Storage Temperature	-65°C to +150°C

1. Exceeding any one or combination of these limits may cause permanent damage to this device.
2. M/A-COM does not recommend sustained operation near these survivability limits.

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Electrical Specifications: $T_A = -55$ to $+85^\circ\text{C}$, $V_c = 0\text{ V} / -5\text{ V}$, $Z_0 = 50\ \Omega$ ^{4,5}

Parameter	Frequency	Unit	Min	Typ	Max
Insertion Loss	DC - 0.5 GHz	dB	—	—	0.8
	DC - 1 GHz	dB	—	—	0.9
	DC - 2 GHz	dB	—	—	1.0
	DC - 4 GHz	dB	—	—	1.3
Isolation	DC - 0.5 GHz	dB	35	—	—
	DC - 1 GHz	dB	30	—	—
	DC - 2 GHz	dB	25	—	—
	DC - 4 GHz	dB	20	—	—
VSWR	DC - 0.5 GHz	Ratio	—	—	1.25:1
	DC - 1 GHz	Ratio	—	—	1.25:1
	DC - 2 GHz	Ratio	—	—	1.5:1
	DC - 4 GHz	Ratio	—	—	1.9:1
Trise, Tfall ⁵	10% to 90% RF, 90% to 10% RF	nS	—	2	—
Ton, Toff ⁵	50% control to 90% RF, 50% control to 10% RF	nS	—	4	—
Transients ⁵	In-Band	mV	—	25	—
Input P1dB	0.5 - 4 GHz, 0 / -5 VDC	dBm	—	26	—
	0.05 GHz, 0 / -5 VDC	dBm	—	20	—
	0.5 - 4 GHz, 0 / -8 VDC	dBm	—	32	—
	0.05 GHz, 0 / -8 VDC	dBm	—	23	—
IP2	For two-tone input power up to +13 dBm				
	0.5 - 4 GHz	dBm	—	68	—
IP3	For two-tone input power up to +13 dBm				
	0.5 - 4 GHz	dBm	—	46	—
Control Current	$ V_c = 0$ to 0.2 V	μA	—	—	5
	$ V_c = 5\text{ V}$	μA	—	10	—
	$ V_c = 8\text{ V}$	μA	—	—	100

4. See MIL-STD-883 for environmental screening options.

5. Faster switching speed can be achieved with enhanced driver waveform.

Handling Procedures

Please observe the following precautions to avoid damage:

Static Sensitivity

Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Truth Table^{6,7}

Control	1	2	3	4	5	6	7	8	9	10	11	12
1	0	0	1	0	1	0	1	On	Off	Off	Off	
0	1	1	0	0	1	0	1	Off	On	Off	Off	
0	1	0	1	1	0	0	1	Off	Off	On	Off	
0	1	0	1	0	1	1	0	Off	Off	Off	On	

6. 0 = 0 V to -0.2 V, 1 = -5 V to -8 V

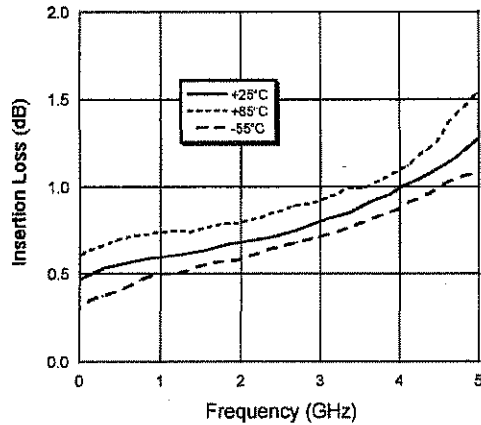
7. When an RF output port is "off" it is shorted to ground through an "on" shunt MESFET.



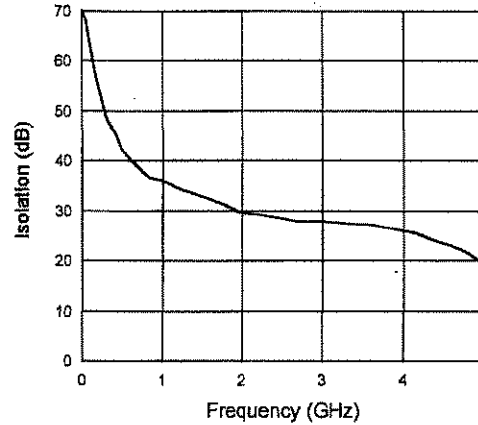
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Typical Performance Curves

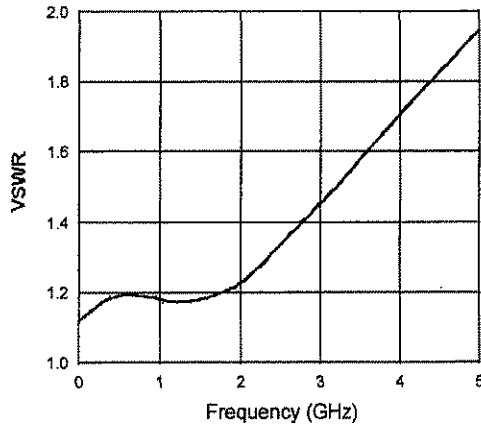
Insertion Loss



Isolation



VSWR



CR-4

